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(54) **SPIN HEAD AND SUBSTRATE TREATING METHOD USING THE SAME**

(75) Inventors: **Hyun Jong Kim**, Cheonan-shi (KR); **Ju Won Kim**, Cheonan-shi (KR); **Jung Keun Cho**, Seoul (KR)

(73) Assignee: **Semes Co., Ltd.**, Chungcheongnam-do (KR)

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F26B 11/02 (2006.01)

(52) **U.S. Cl.** **34/381**; 34/78; 34/80; 414/217; 118/313; 134/200

(58) **Field of Classification Search** 34/77, 34/78, 80, 3, 381; 414/217; 134/200; 118/313
See application file for complete search history.

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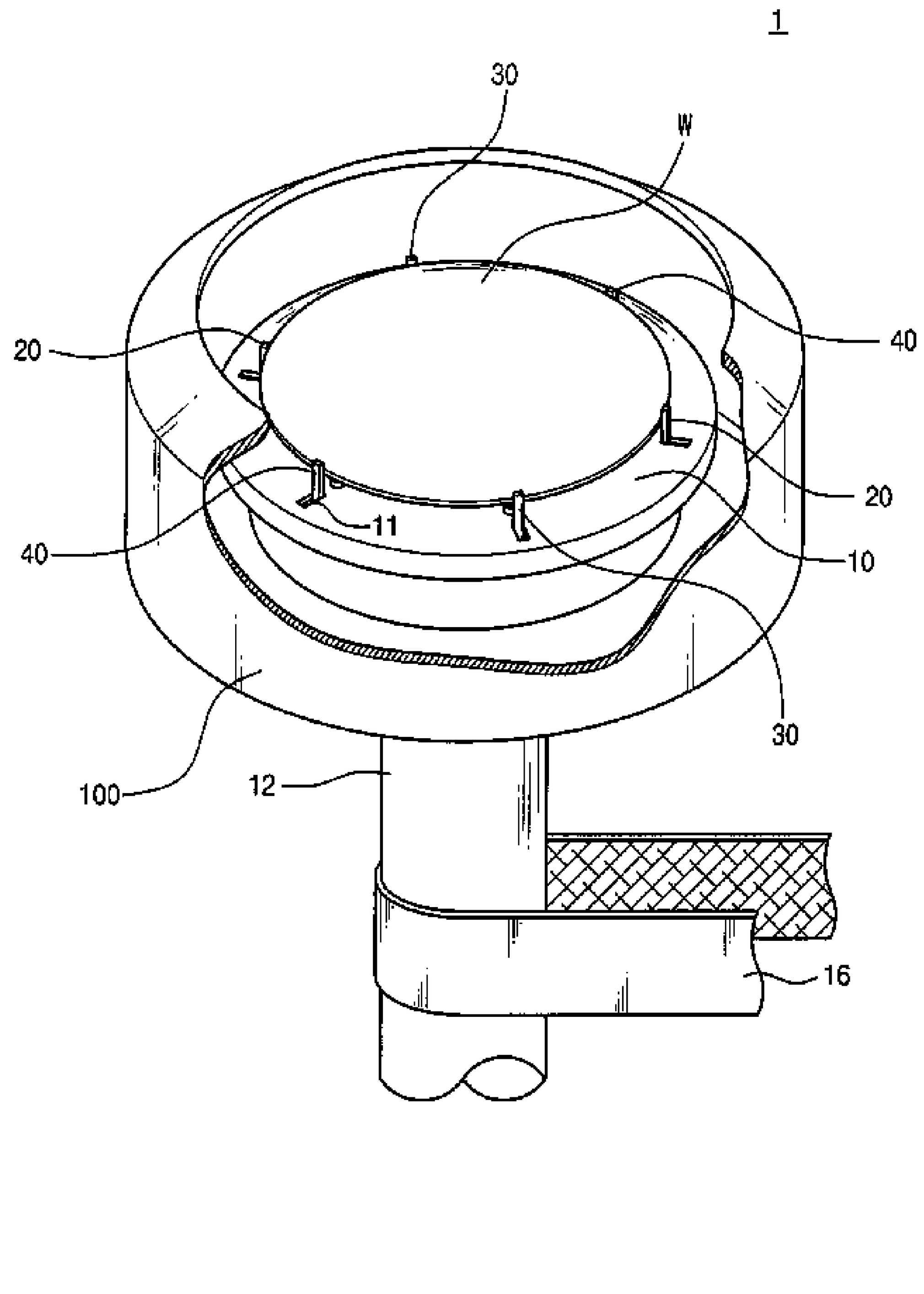
Primary Examiner—Stephen M. Gravini
(74) *Attorney, Agent, or Firm*—Harness, Dickey & Pierce, P.L.C.

(57) **ABSTRACT**

A spin head includes a rotatable plate, first chucking pins and second chucking pins for supporting a edge portion of a substrate loaded on the plate, and a driving unit for selectively driving the first and second chucking pins. The driving unit includes a first magnet connected to the first chucking pin and disposed at a first height, a second magnet connected to the second chucking pin and disposed at a second height, and a driving magnet for driving the first and second magnets. The driving magnet is elevated by means of an elevating member to selectively apply a magnetic force to the first or second magnet and moves in the radius outside direction of the first or second chucking pin due to a magnetic force.

15 Claims, 13 Drawing Sheets



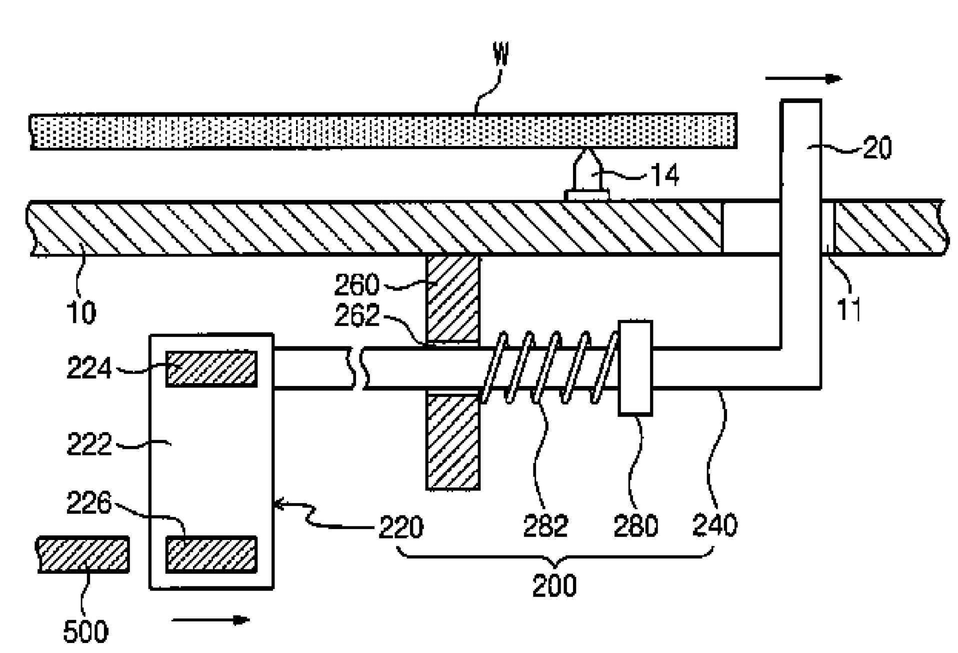


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Fig. 1

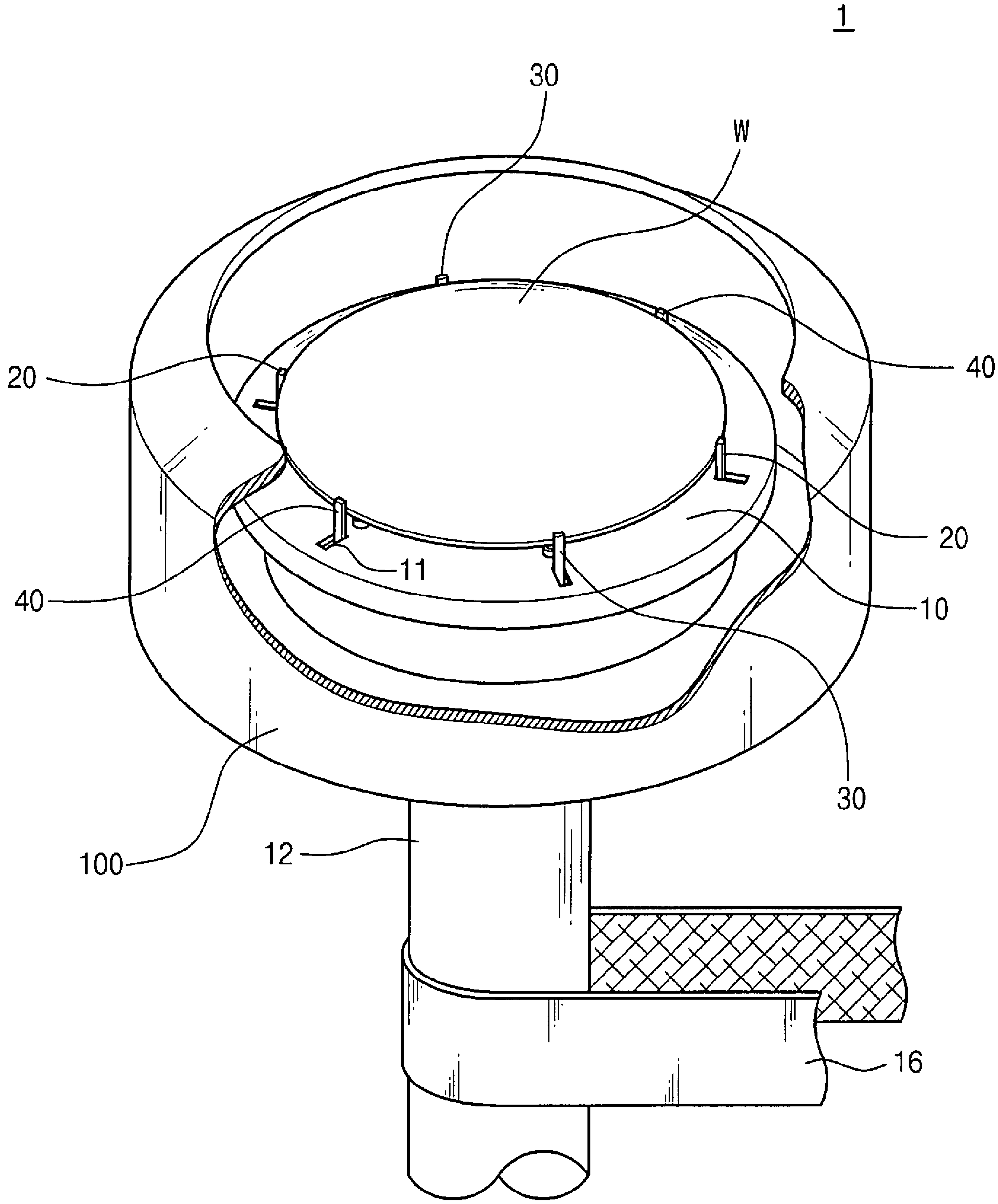


Fig. 2

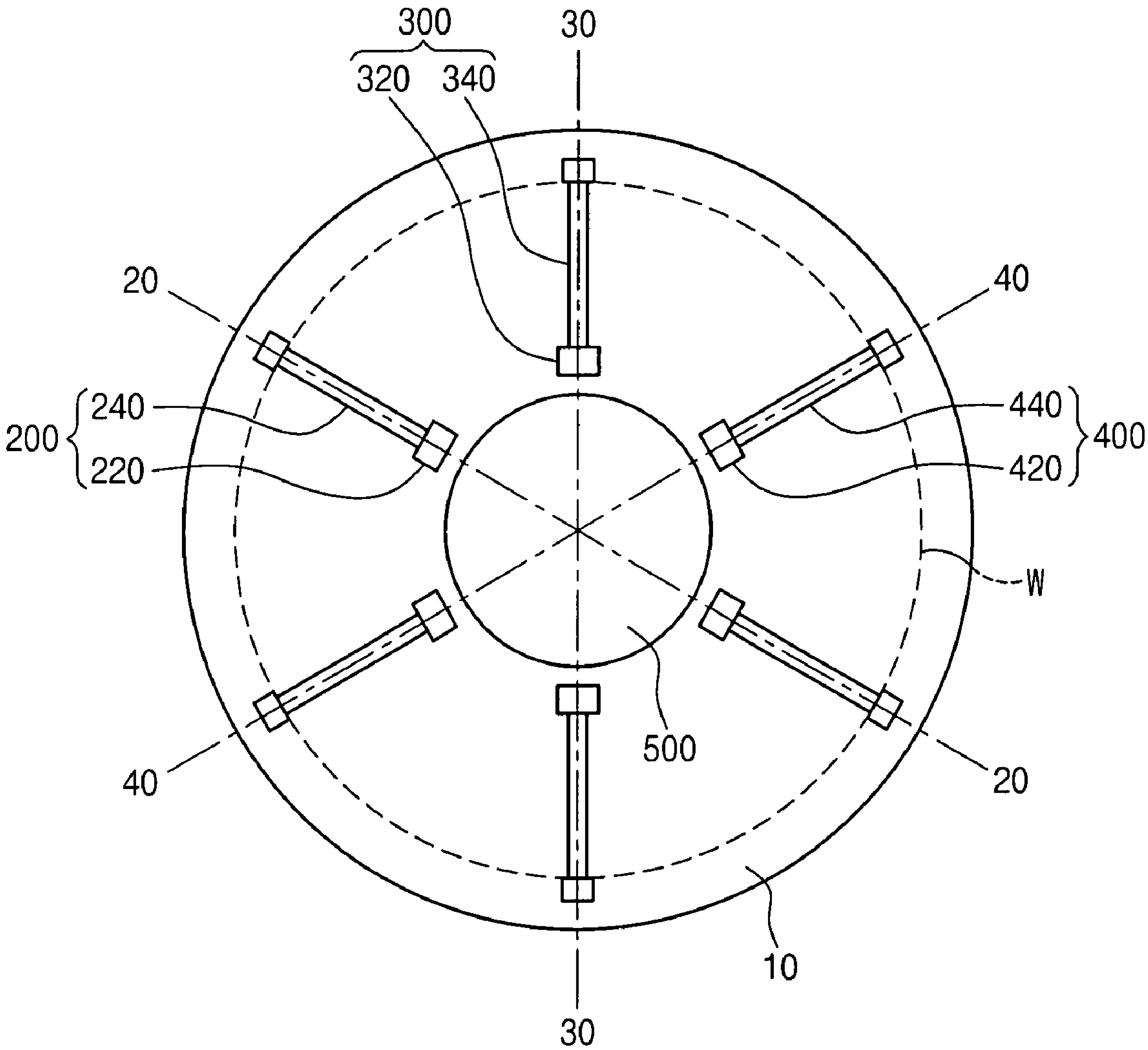
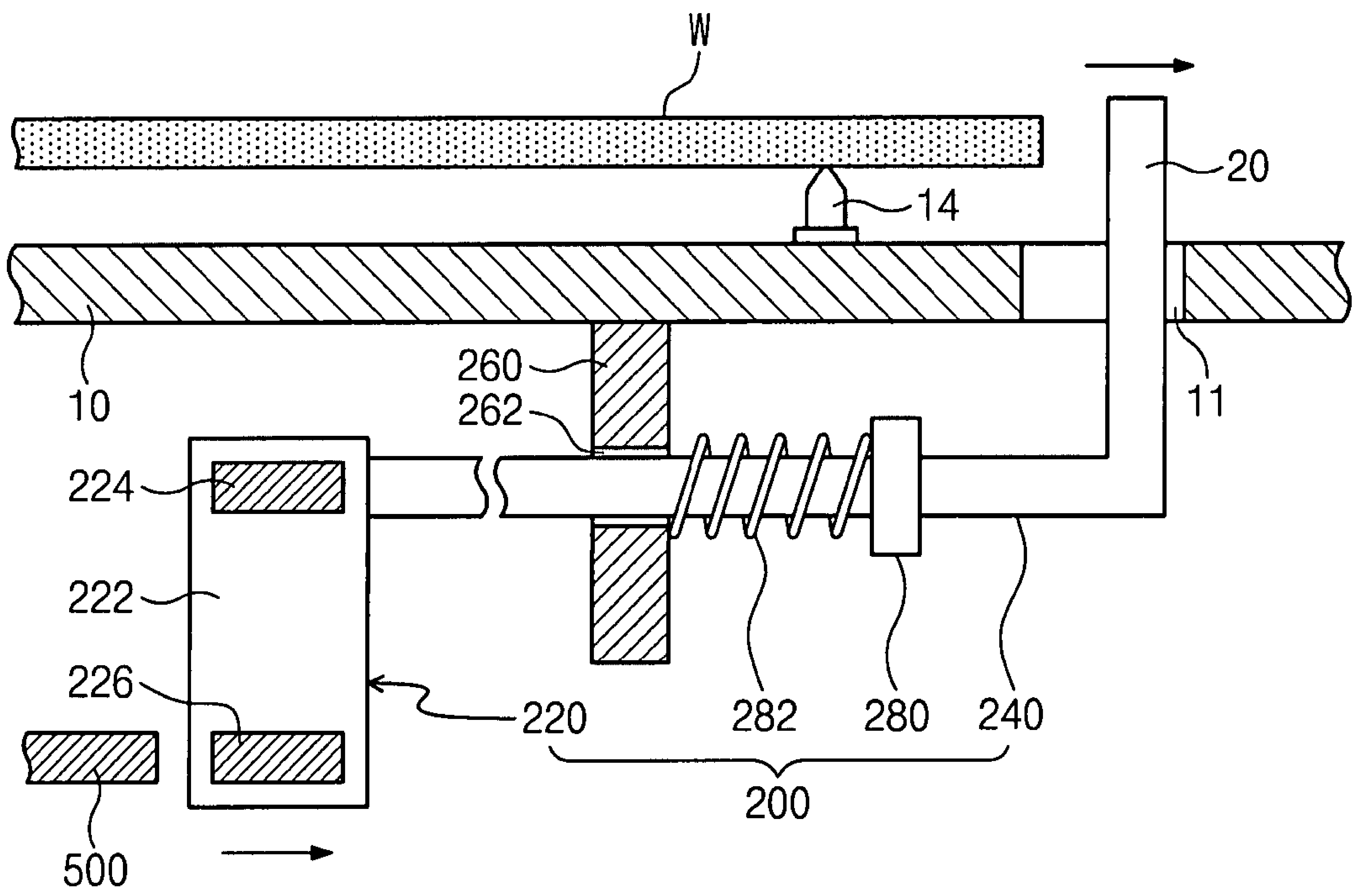


Fig. 3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262
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200
500

Fig. 4

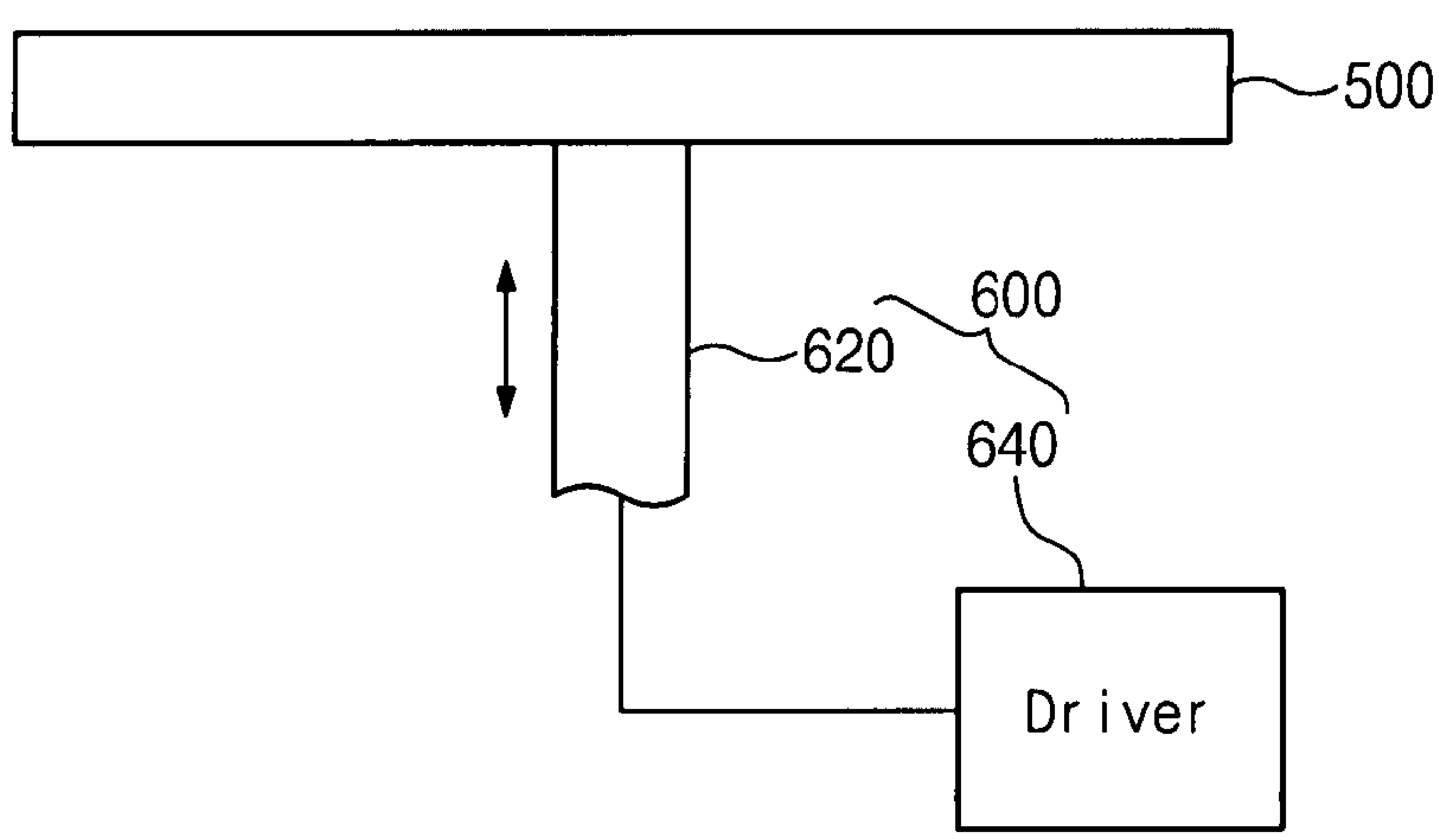

500
600
620
640
Driver

Fig. 5A

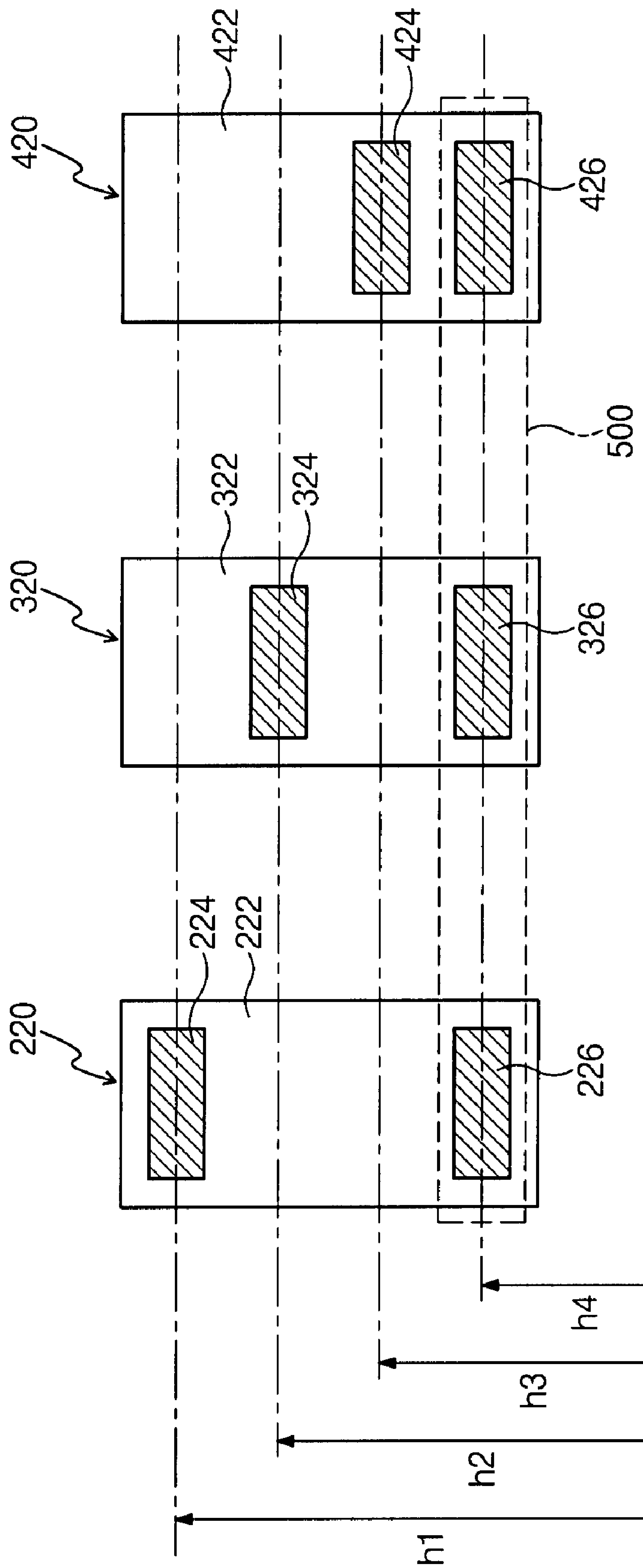


Fig. 5B

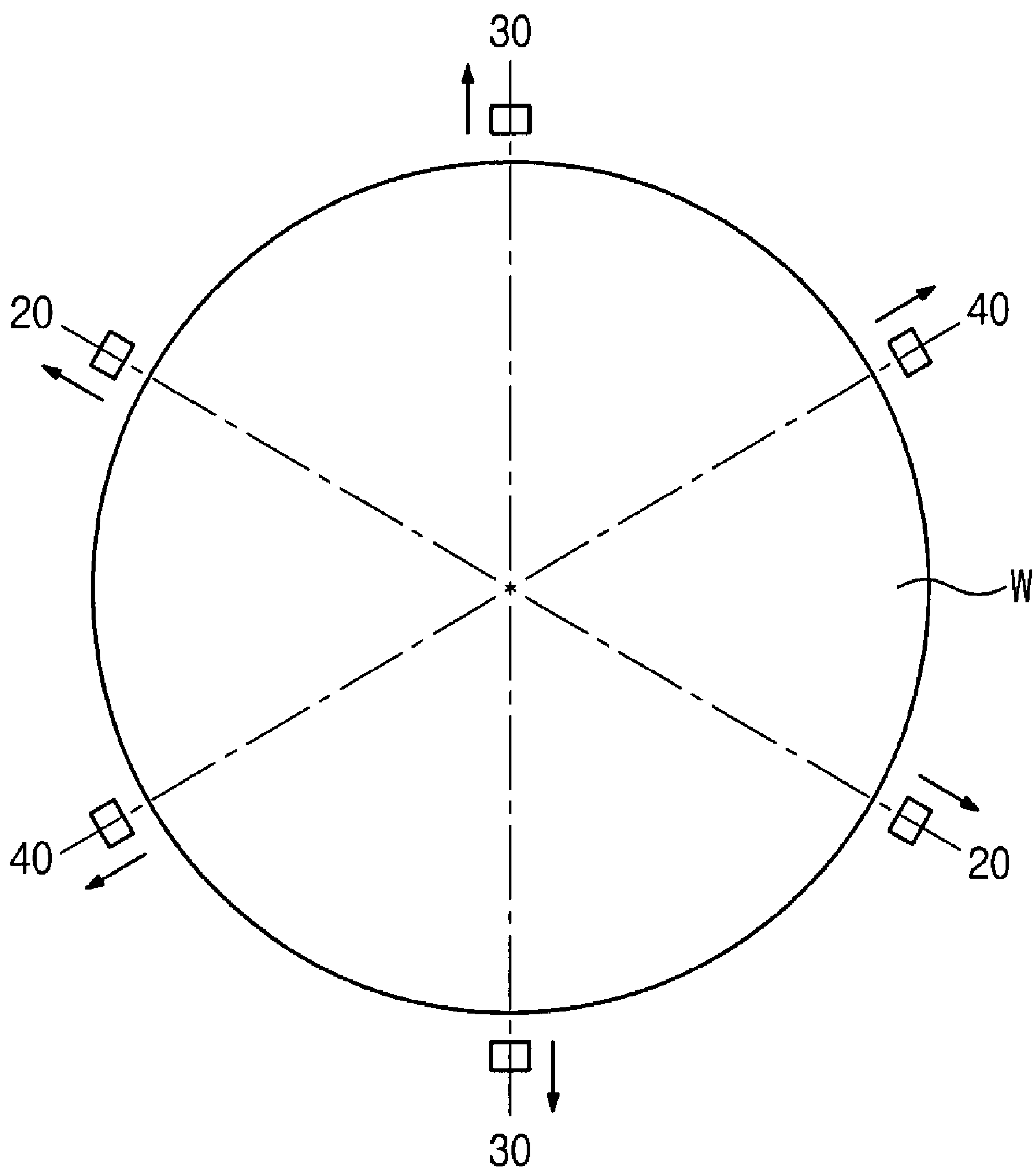


Fig. 6A

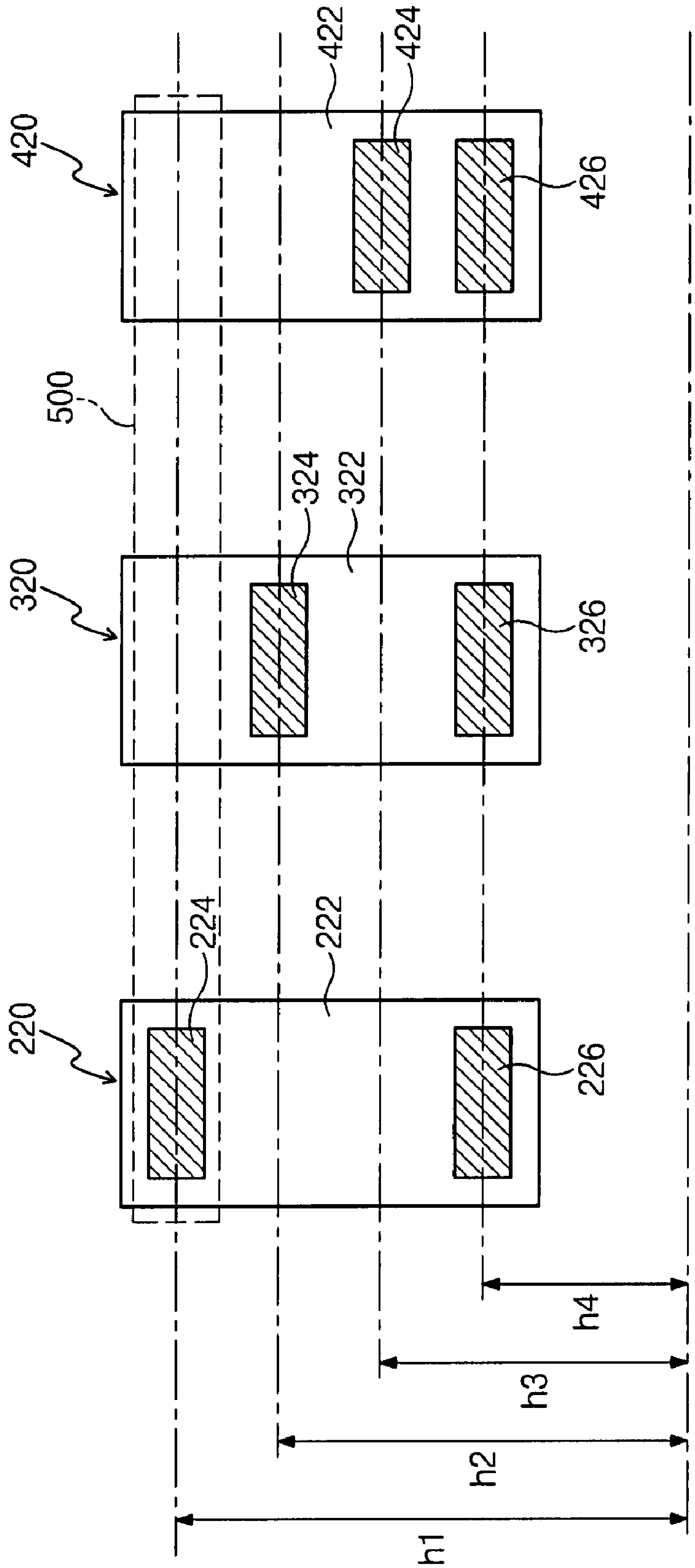


Fig. 6B

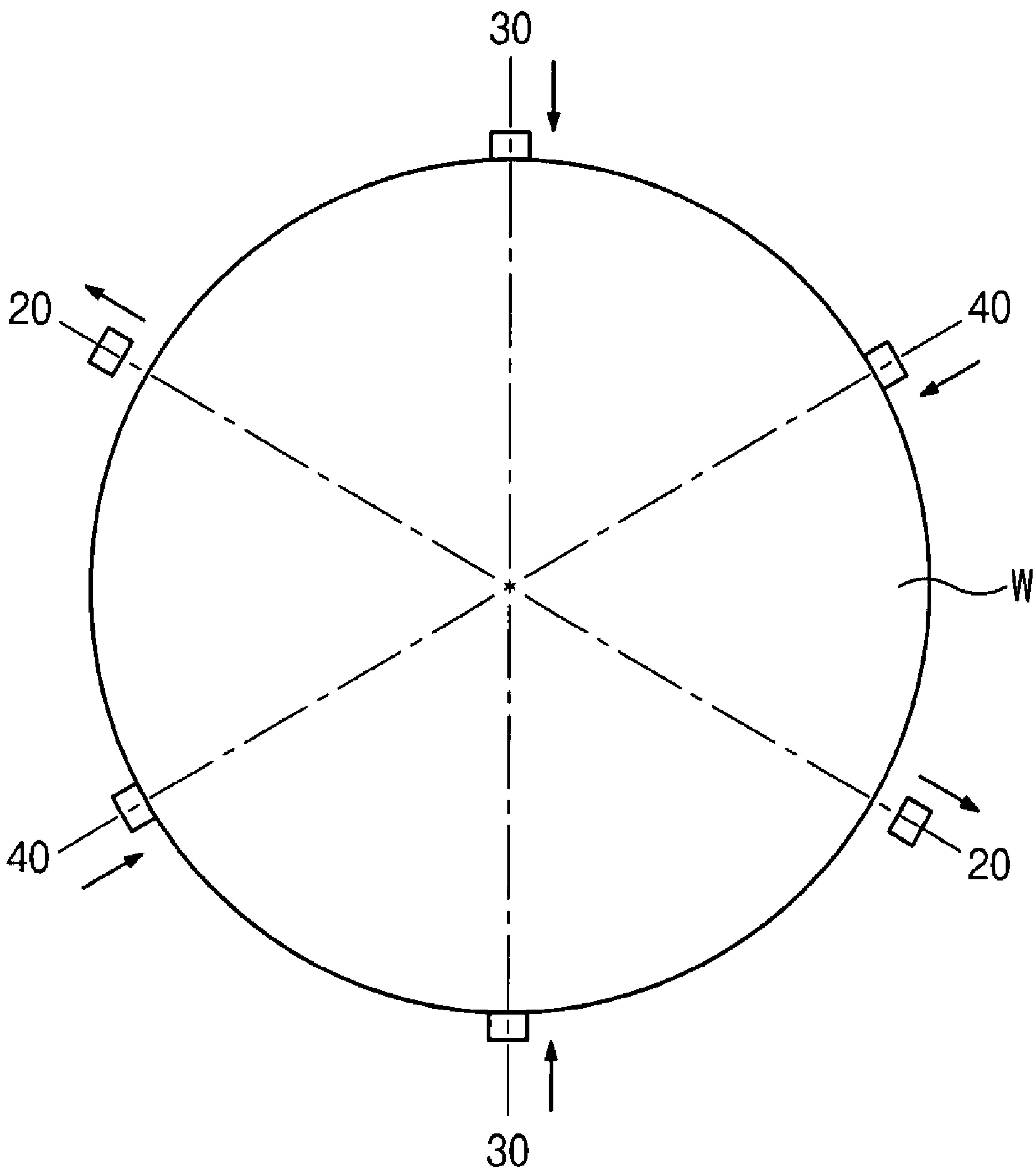


Fig. 7A

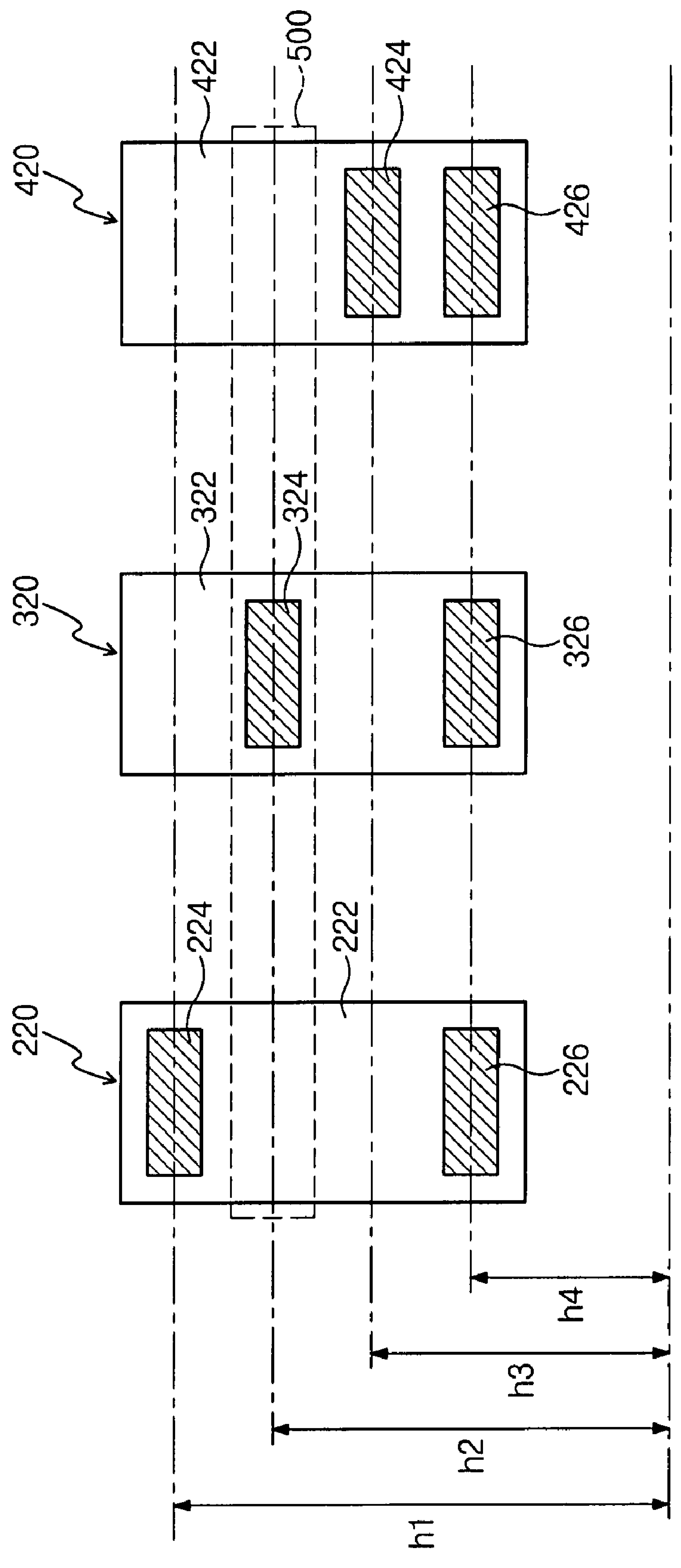


Fig. 7B

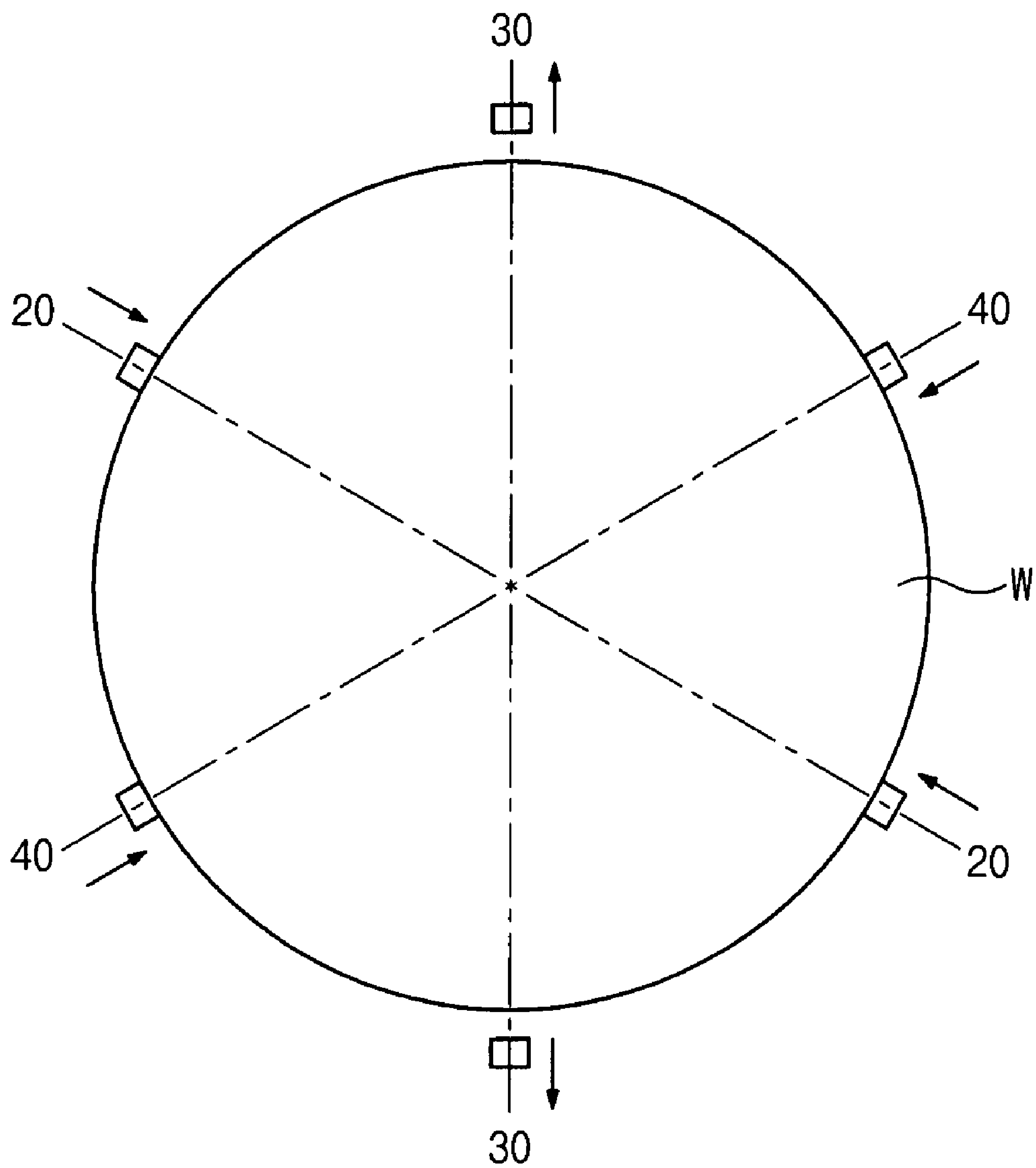


Fig. 8A

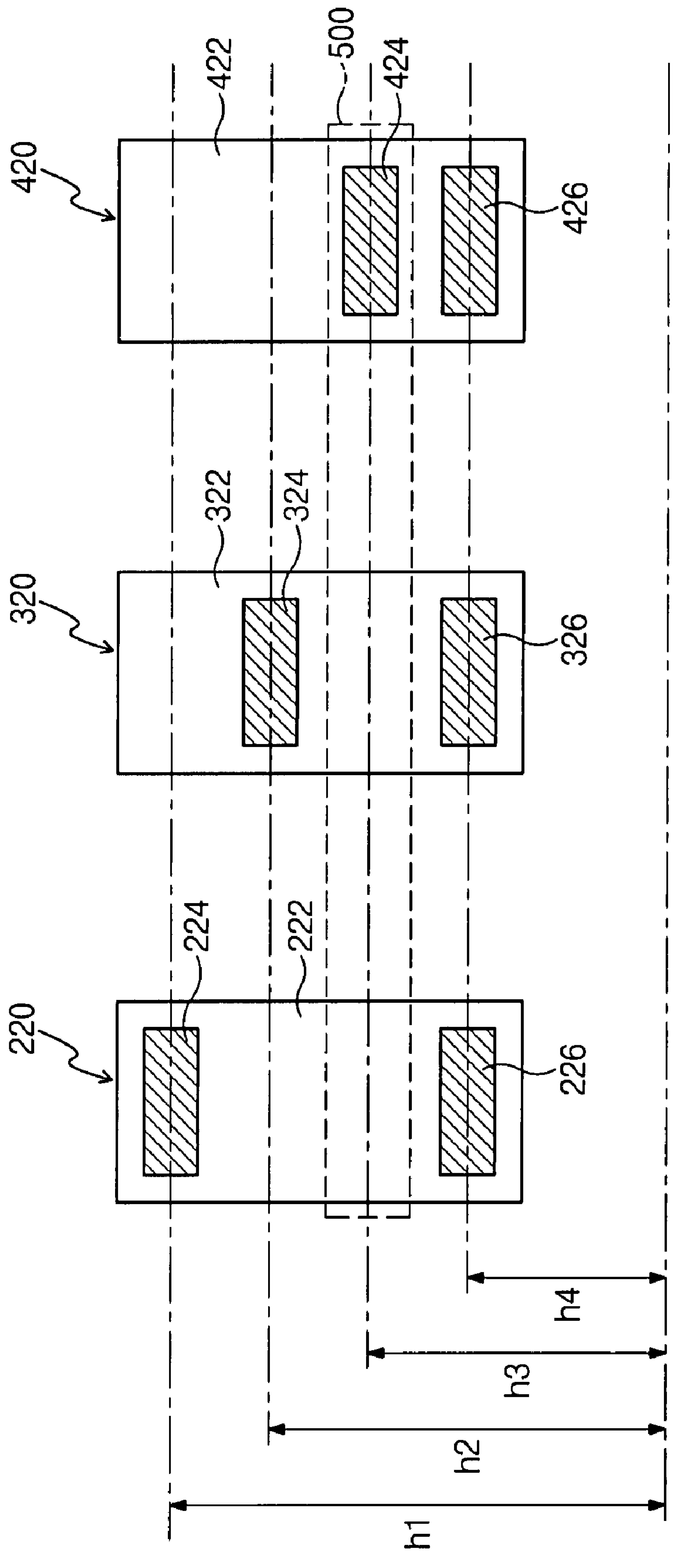


Fig. 8B

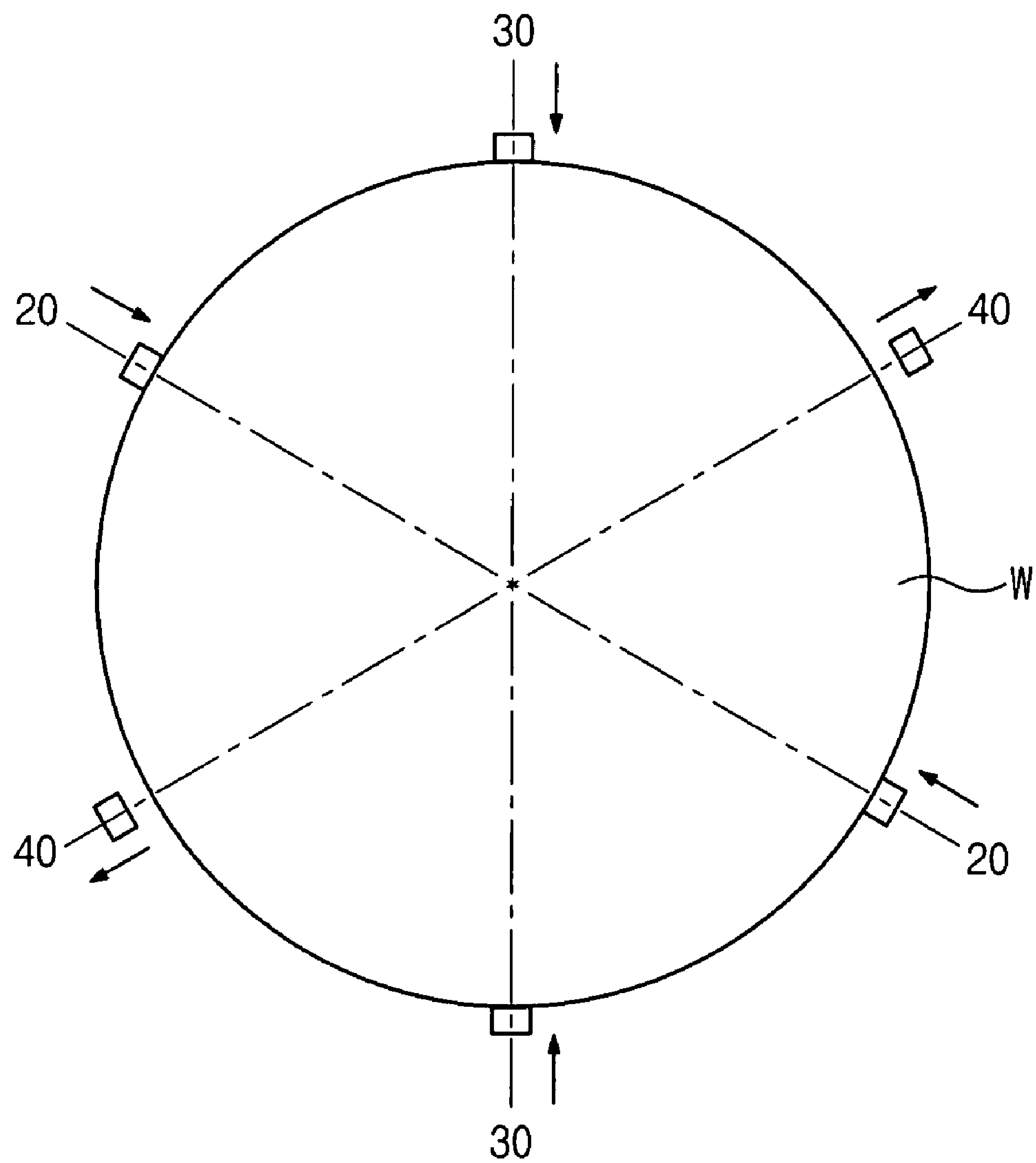


Fig. 9

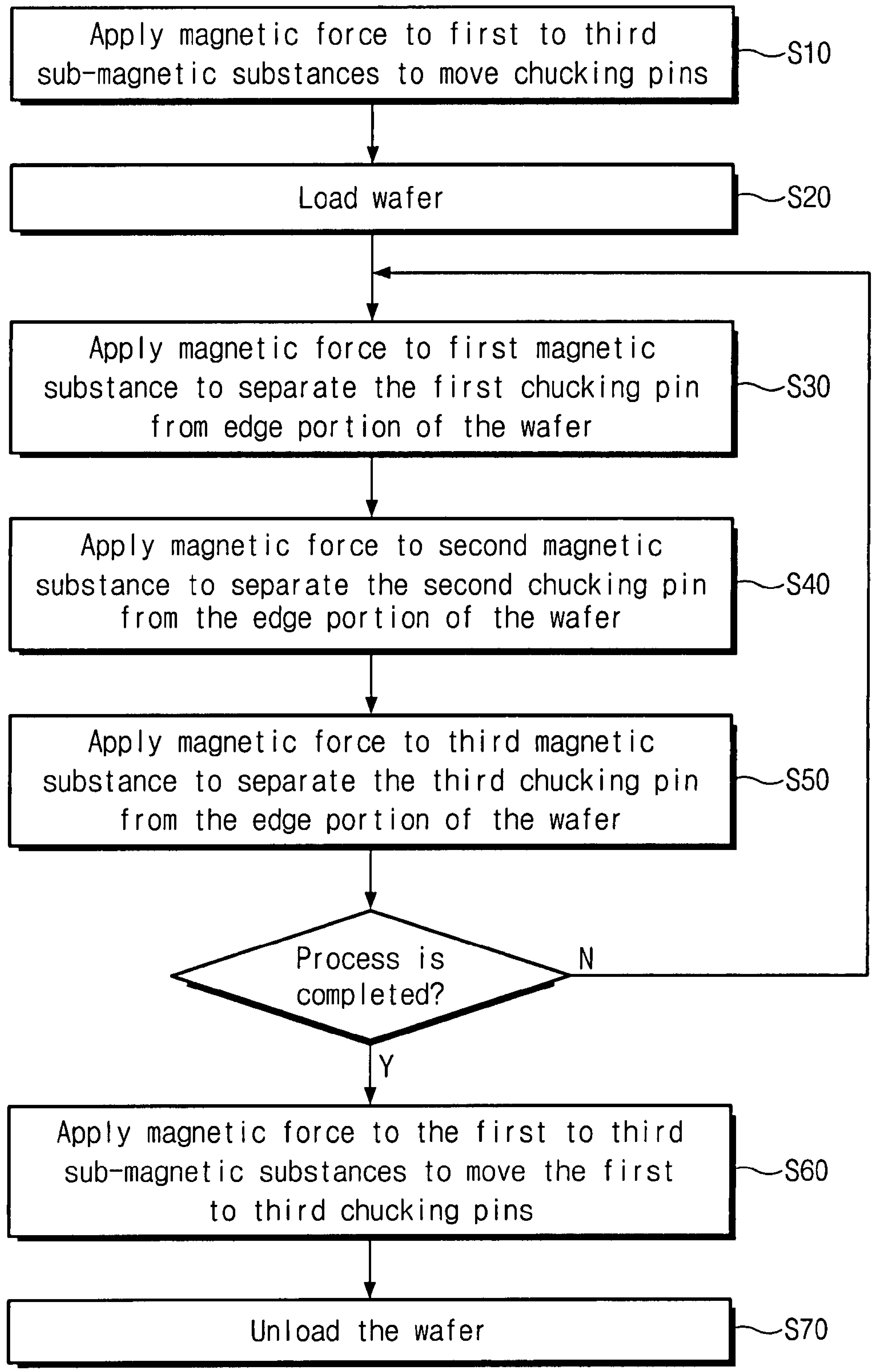
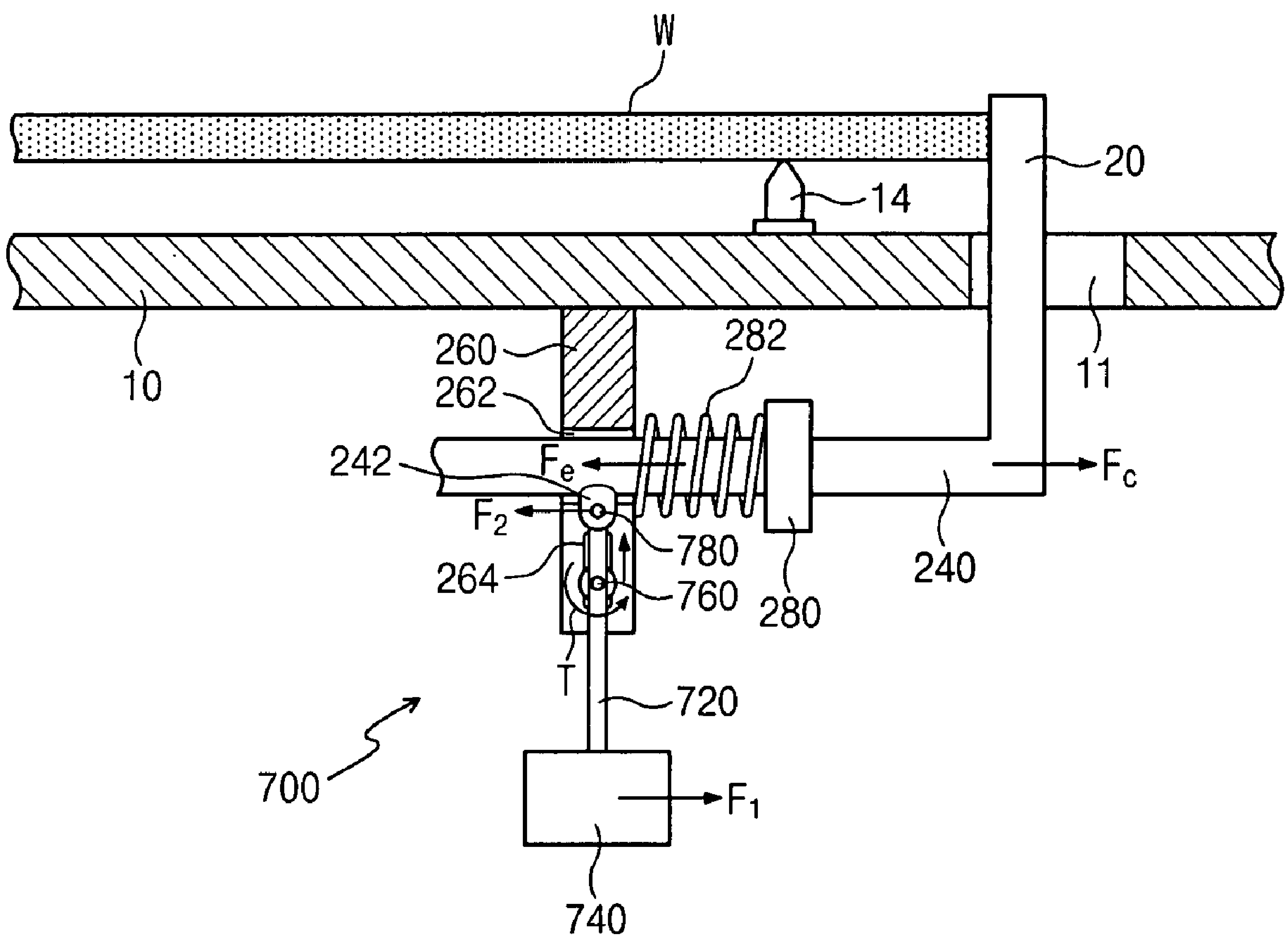

Apply magnetic force to first to third sub-magnetic substances to move chucking pins
S10
Load wafer
S20
Apply magnetic force to first magnetic substance to separate the first chucking pin from edge portion of the wafer
S30
Apply magnetic force to second magnetic substance to separate the second chucking pin from the edge portion of the wafer
S40
Apply magnetic force to third magnetic substance to separate the third chucking pin from the edge portion of the wafer
S50
Process is completed?
N
Y
Apply magnetic force to the first to third sub-magnetic substances to move the first to third chucking pins
S60
Unload the wafer
S70

Fig. 10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740

SPIN HEAD AND SUBSTRATE TREATING METHOD USING THE SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

This U. S non-provisional patent application claims priority under 35 U.S.C §119 of Korean Patent Application 2006-82800 filed on Aug. 30, 2006, the entirety of which is hereby incorporated by reference.

BACKGROUND

The present invention relates to a spin head and a substrate treating method using the same. More specifically, the present invention is directed to a spin head provided to remove chemicals remaining at a contact portion of a substrate held by a chucking pin during a process and a substrate treating method using the spin head.

Through a variety of processes, desired patterns are formed on a substrate such as a semiconductor substrate, a glass substrate or liquid crystal panel. In etching and cleaning processes, a wafer spins to remove residues or thin films thereon. While spinning a substrate such as a wafer at thousands of RPM, deionized water (DI water) or etching solution or cleaning solution is supplied. Undoubtedly, the substrate spinning operation has been identically applied to not only a cleaning process but also other semiconductor manufacturing processes such as a photoresist process.

Generally, there are two methods of holding a wafer. One is that the rear surface of a wafer is vacuum-adsorbed to hold the wafer, and the other is that the edge of a wafer is mechanically fixed by means of a support member from the edge of the wafer to hold the wafer. In the latter method, the support member continues to contact and support the same portion of the wafer at the same position until a process is ended. Even after the process ends, chemicals may remain at a contact surface between the support member and the wafer and around there. The remaining chemicals may be hardened or left as debris to contaminate the wafer or peripheral components during the subsequent processes.

SUMMARY OF THE INVENTION

Exemplary embodiments of the present invention are directed to a spin head. In an exemplary embodiment, the spin head may include: a rotatable support plate; first chucking pins and second chucking pins installed on a top surface of the support plate and supporting a edge portion of a substrate to prevent the substrate loaded on the support plate from separating from the support plate when the support plate rotates; and a driving unit for selectively moving the first and second chucking pins in the radius outside direction of the support plate by means of a magnetic force such that the first and second chucking pins are not in contact with the edge portion of the substrate during a process.

In another exemplary embodiment, the spin head may include: a rotatable plate; first chucking pins, second chucking pins, and third chucking pins installed on a top surface of the support plate and supporting a edge portion of a substrate to prevent the substrate loaded on the support plate from separating from the support plate when the support plate is rotated; and a driving unit for moving the first to third chucking pins in a radius direction of the support plate such that the first to third chucking pins are in contact with or not in contact with the edge portion of the substrate, wherein the driving unit allows one of the first to third chucking pins not to be in contact with the edge portion of the substrate by means of a magnetic force.

Exemplary embodiments of the present invention are directed to a substrate treating method performed by providing a spin head comprising first and second chucking pins for supporting a edge portion of a substrate loaded on a support plate and a driving unit for moving the first and second chucking pins in a radius direction of the support plate and supplying a treating solution to the substrate loaded on the spin head. In an exemplary embodiment, the substrate treating method may include: a first step in which a driving magnet of the driving unit is elevated to apply a magnetic force to first magnets connected to the first chucking pins respectively, and the first chucking pins are spaced apart from the edge portion of the substrate by the magnetic force; and a second step in which the driving magnet is elevated to apply a magnetic force to a second magnet connected to the respective second chucking pins, and the second chucking pins are spaced apart from the edge portion of the substrate by the magnetic force, wherein the first magnet is disposed at a first height and the second magnet is disposed at a second height that is different from the first height, and the first step and the second step are alternately repeated by the elevation of the driving magnet.

In another exemplary embodiment, the substrate treating method may include: supporting a edge portion of a substrate loaded on a support plate by means of first chucking pins, second chucking pins, and third chucking pins during a process, wherein one selected from the first to third chucking pins is not in contact with the edge portion of the substrate and the others are in contact therewith, and one chucking pin not being in contact with the edge portion of the substrate is alternately selected.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a substrate treating apparatus according to the present invention.

FIG. **2** is a top plan view of a driving unit according to the present invention.

FIG. **3** illustrates a first follower part according to the present invention.

FIG. **4** illustrates a driving magnet and an elevating member according to the present invention.

FIGS. **5**A-**8**B illustrate the state where first to third chucking pins are driven by means of a driving unit according to the present invention.

FIG. **9** is a flowchart illustrating a substrate treating method according to the present invention.

FIG. **10** illustrates the driving state of a safety unit according to the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention, however, may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout.

FIG. **1** illustrates a substrate treating apparatus **1** according to the present invention. The substrate treating apparatus **1** includes a plate **10**, a container **100** configured to cover the plate **10**, and first chucking pins **20**, second chucking pins **30**, and third chucking pins **40** installed on a top surface of the plate **10**.

The plate **10** exhibits the shape of a disk corresponding to a wafer W and is located below the wafer W during a process. A plurality of through-holes **11** are formed at the top of the plate **10**. The chucking pins **20**, **30**, and **40** are installed at their holes **11**, respectively.

A rotation shaft **12** is connected to the bottom of the plate **10** to rotate the plate **10**. The rotation shaft **12** is rotated by means of a belt **16** connecting a driving motor (not shown) to a driving pulley (not shown), which is to spin the wafer W during a process. When the rotation shaft **12** is rotated by means of the belt **16**, the plate **10** connected to the rotation shaft **12** is also rotated to spin the wafer W loaded on the plate **10**.

The container **100** is provided to prevent chemicals remaining on the top surface of the wafer W from scattering to the outside during the rotation of the plate **10**. An aperture is formed at the top of the container **100**. The wafer W is loaded on the plate **10** or unloaded from the plate **10** through the aperture.

As described above, the chucking pins **20**, **30**, and **40** are installed at their through-holes **11** formed at the plate **10**, respectively. These chucking pins **20**, **30**, and **40** are provided together to support the wafer W loaded on the plate **10**. In this embodiment, six through-holes **11** are formed and six chucking pins **20**, **30**, and **40** are provided correspond to the six through-holes **11**, respectively. That is, two first chucking pins **20** are provided to correspond to two through-holes **11**, respectively; two second chucking pins **30** are provided to correspond to two through-holes **11**, respectively; and two third chucking pins **40** are provided to correspond to two through-holes **11**, respectively. These chucking pins **20**, **30**, and **40** are movable within their through-holes **11** in a radius direction of the plate **10**, respectively.

The wafer W should be safely supported by means of the chucking pins **20**, **30**, and **40** during a process. Accordingly, the chucking pins **20**, **30**, and **40** are disposed equiangularly or others.

As illustrated in FIG. **3**, a support pin **40** is installed on the top surface of the plate **10** to support the bottom surface of the wafer W loaded on the plate **10**.

FIG. **2** is a top plan view of a driving unit according to the present invention, and FIG. **3** illustrates a first follower part **200** according to the present invention. FIG. **4** illustrates a driving magnet **500** and an elevating member **600** according to the present invention.

The driving unit includes a first follower part **200** connected to a first chucking pin **20**, a second follower part **300** connected to a second chucking pin **30**, a third follower part **400** connected to a third chucking pin **40**, and a driving magnet **500** configured to drive the first to third follower parts **200**, **300**, and **400**. The driving unit allows the first to third chucking pins **20**, **30**, and **40** to make a straight reciprocating motion in a radius direction of the support plate **10**.

The first follower part **200** includes a first follower **220** disposed to be opposite to the driving magnet **500** and a first follower rod **24*o*** connecting the first chucking pin **20** to the first follower **220**. Similarly, the second follower part **300** includes a second follower **320** and a second follower rod **340**, and the third follower part **400** includes a third follower **420** and a third follower rod **440**.

As illustrated in FIG. **2**, a disk-shaped deriving magnet **500** is disposed inside the first to third followers **220**, **320**, and **420**. The driving magnet **500** is elevated by means of an elevating the elevating member **600**. Due to the elevation of the driving magnet **500**, a magnetic force is applied to one of these followers **220**, **320**, and **420**. The magnetic-force-received one of these followers **220**, **320**, and **420** travels in the radius direction of the support plate **10**. At this point, a chucking pin connected to the magnetic-force-received follower also travels, which will be described in detail later.

As illustrated in FIG. **4**, the elevating member **600** includes a support shaft **620** connected to the bottom of the driving magnet **500** and a driver **640** configured to drive the support shaft **620**. The driving magnet **500** is elevated with the support shaft **620** by means of the driver **640**.

As illustrated in FIG. **3**, the first follower **220** includes a first housing **222**, a first magnet **224**, and a first sub-magnet **226**. The first housing **222** is provided to offer a space in which the first magnet **224** and the first sub-magnet **226** are accommodated. The first magnet **224** is disposed at the uppermost portion, and the first sub-magnet **226** is disposed at the lowermost portion.

One side of the first magnet **224** and the first sub-magnet **226** disposed in opposition to the driving magnet **500** has the same polarity as the outer side of the driving magnet **500** disposed in opposition to the first magnet **224** and the first sub-magnet **226**. Thus, when a magnetic force is applied to the first magnet **224** and the first sub-magnet **226** due to the elevation of the driving magnet **500**, a repulsive force is generated between the driving magnet **500** and the first magnet **224** or between the driving magnet **500** and the first sub-magnet **226**. The repulsive force allows the first follower **220** and the first chucking pin **20** to travel in an outside direction of the support plate **10**.

One end of the first follower rod **240** is connected to the first follower **220**, and the other end thereof is connected to the bottom of the first chucking pin **20**. Accordingly, when a magnetic force is applied by means of the driving magnet **500**, the first follower **220** travels in the radius direction of the support plate **10** and the first chucking pin **20** connected to the first follower **220** by the first follower rod **240** also travels.

The first follower **200** includes a first bush **260**, which perpendicularly extends downwardly from the rear surface of the support plate **10**. A first guide hole **262** is formed at the first bush **260** to penetrate in the radius direction of the support plate **10**. The follower rod **240** is inserted into the first guide hole **262**. The first guide hole **262** is provided to guide the travel direction of the first follower rod **240** such that the first follower rod **240** travels in the radius direction of the support plate **10**.

A first fixture **280** is installed on the first follower rod **240** and disposed between the first bush **260** and the first chucking pin **20**. The first fixture **280** protrudes toward the outer side from the outer circumferential surface of the first follower rod **240**.

A first elastic substance **282** is provided between the first bush **260** and the first fixture **280**. One end of the first elastic substance **282** is fixed to the first bush **260**, and the other end thereof is fixed to the first fixture **280**. The first elastic substance **282** is an extension spring, which applies an elastic force in the radius inside direction of the support plate **10**. Thus, the first fixture **280** receives the elastic force in the radius inside direction of the support plate **10** and the first chucking pin **20** is maintained to come in contact with a edge portion of the wafer W when an external force is not applied.

Each of the second and third follower parts **300** and **400** has the same configuration as the first follower part **200**. Therefore, the first and second follower parts **300** and **400** will not be described in further detail.

FIGS. **5A-8B** illustrate the state where first to third chucking pins **20**, **30**, and **40** are driven by means of the driving unit according to the present invention. FIG. **9** is a flowchart illustrating a substrate treating method according to the present invention. The substrate treating method will now be described below with reference to FIGS. **5A-8B** and FIG. **9**.

In FIGS. **5A** and **5B**, a magnetic force is applied to first to third sub-magnet **226**, **326**, and **426** by means of a driving magnet **500** according to the present invention. The configurations of first to third followers **220**, **320**, and **420** will be described below in detail with reference to FIG. **5A**.

As previously stated, the driving unit includes a first follower **220**, a second follower **320**, and a third follower **420**. Further, the driving unit includes a first magnet **224** disposed at the uppermost portion and a first sub-magnet **226** disposed at the lowermost portion, which are accommodated in a first housing **222**.

More specifically, the first magnet **224** is disposed at a first height h_1 and the first sub-magnet **226** is disposed at a fourth height h_4, as illustrated in FIG. **5A**.

The second follower **320** includes a second magnet **324** and a second sub-magnet **326**, which are accommodated in a second housing **322**. The second magnet **324** is disposed at a second height h_2, which is lower than the first magnet **224**. The second sub-magnet **326** is disposed at a fourth height h_4, which is as high as the first sub-magnet **226**.

The third follower **420** includes a third magnet **424** and a third sub-magnet **426**, which are accommodated in a third housing **422**. The third magnet **424** is disposed at a third height h_3, which is lower than the first and second magnet **224** and **324**. The third sub-magnet **426** is disposed at a fourth height h_4, which is as high as the first and second sub-magnets **226** and **326**.

The first to fourth heights h_1, h_2, h_3, and h_4 should be suitable to prevent a magnetic force from being applied to a magnet disposed at a different height from the driving magnetic substance **500**. For example, when the driving magnet **500** is disposed at the second height h_2, the magnetic force of the driving magnet **500** should be applied only to the second magnet **324** disposed at the second height h_2 and should not be applied to the first magnet **224** disposed at the first height h_1 or the third magnet **424** disposed at the third height h_3.

In order to load a wafer W on the support plate **10**, a larger space should be secured on the support plate **10** than the diameter of the wafer W. However, it is difficult to secure the larger space on the support plate **10** because the first to third chucking pins **20**, **30**, and **40** receive an elastic force in the radius inside direction of the support plate **10** when an external force is not applied. Hence, an external force should be applied in the radius outside direction of the support plate **10**. Further, if the external force is stronger than the elastic force, the first to third chucking pins **20**, **30**, and **40** may travel in the radius outside direction of the support plate **10** and the larger space may be secured on the support plate **10**.

The driving magnet **500** is disposed at the fourth height h_4 by means of the elevating member **600** to apply a magnetic force to the first to third sub-magnets **226**, **326**, and **426** (S**10**). When the driving magnet **500** is disposed at the fourth height h_4, a repulsive force is generated between the driving magnet **500** and each of the first to third sub-magnets **226**, **326**, and **426**. The repulsive force offsets an elastic force and allows the first to third followers **220**, **320**, and **420** to travel in the radius outside direction of the support plate **10**.

In order to enable a repulsive force to offset an elastic force, the repulsive force should be stronger than the elastic force. The intensity of the repulsive force may be experimentally selected by the intensity of a magnetic force generated between the driving magnet **500** and each of the first to third sub-magnets **226**, **326**, and **426** and a distance between the driving magnet **500** and each of the first to third followers **220**, **320**, and **420**.

When the first to third followers **220**, **320**, and **420** travel in the radius outside direction of the support plate **10**, the first to third chucking pins **20**, **30**, and **40** also travel in the radius outside direction of the support plate **10** to secure a space enough to load a wafer W on the support plate **10**.

The wafer W is loaded on the support plate (S**20**). A support pin **14** is provided on the support plate **10** to support the bottom surface of the wafer W loaded on the support plate **10**.

The driving magnet **500** is located at the first height h_1 by means of the elevating member **600** to apply a magnetic force to the first magnet **224** (S**30**). As illustrated in FIG. **6A**, when the driving magnet **500** is located at the first height h_1, a repulsive force is generated between the driving magnet **500** and the first magnet **224** located at the first height h_1. The repulsive force offsets an elastic force and allows the first follower **220** to travel in the outside direction of radius of the support plate **10**.

The driving magnet **500** is not capable of applying a magnetic force to the second and third magnets **324** and **424** which are disposed at the second and third heights h_2 and h_3, respectively. Thus, the second and third chucking pins **30** and **40** travels with the second and third followers **320** and **420** in the radius inside direction of the support plate **10** due to the elastic force. The second and third chucking pins **30** and **40** come in contact with a edge portion of the wafer W to support the wafer W.

The driving magnet **500** is located at the second height h_2 by means of the elevating member **600** to apply a magnetic force to the second magnet **324** (S**40**). As illustrated in FIG. **7A**, when the driving magnet **500** is located at the second height h_2, a repulsive force is generated between the driving magnet **500** and the second magnet **324** located at the second height h_2. The repulsive force offsets an elastic force and allows the second follower **320** to travel in the outside direction of radius of the support plate **10**.

The driving magnet **500** is not capable of applying a magnetic force to the first and third magnets **224** and **424** which are disposed at the first and third heights h_1 and h_3, respectively. Thus, the first and third chucking pins **20** and **40** travels with the first and third followers **220** and **420** in the radius inside direction of the support plate **10** due to the elastic force. The first and third chucking pins **20** and **40** come in contact with a edge portion of the wafer W to support the wafer W.

The driving magnet **500** is located at the second height h_3 by means of the elevating member **600** to apply a magnetic force to the third magnet **424** (S**50**). As illustrated in FIG. **8A**, when the driving magnet **500** is located at the third height h_3, a repulsive force is generated between the driving magnet **500** and the third magnet **424** located at the third height h_3. The repulsive force offsets an elastic force and allows the third follower **420** to travel in the outside direction of radius of the support plate **10**.

The driving magnet **500** is not capable of applying a magnetic force to the first and second magnets **224** and **324** which are disposed at the first and second heights h_1 and h_2, respectively. Thus, the first and second chucking pins **20** and **30** travels with the first and second followers **220** and **320** in the radius inside direction of the support plate **10** due to the elastic force. The first and second chucking pins **20** and **30** come in contact with a edge portion of the wafer W to support the wafer W.

One of the first to third chucking pins **20**, **30**, and **40** provided to support the edge portion of the wafer W is separated from the edge portion of the wafer W, and the others are in contact with the edge portion of the wafer W. The first to third chucking pins **20**, **30**, and **40** are sequentially separated from the edge portion of the wafer W, which is repeated until the process is completed. At this point, if chemicals are supplied to a top surface of the wafer W while spinning the wafer W, they are prevented from remaining at portions which are in contact with the first to third chucking pins **20**, **30**, and **40**.

When the above-described process is completed, the driving magnet **500** is located at the fourth height h_4 by means of the elevating member **600** to apply a magnetic force to the first to third sub-magnets **226**, **326**, and **426** (S60). When the driving magnet **500** is located at the fourth height h_4, a repulsive force is generated between the driving magnet **500** and each of the first to third sub-magnets **226**, **326**, and **426**. The repulsive force offsets an elastic force and allows the first to third followers **220**, **320**, and **420** to travel in the radius outside direction of the support plate **10**.

When the first to third followers **220**, **320**, and **420** travel in the radius outside direction of the support plate **10**, the first to third chucking pins **20**, **30**, and **40** also travel in the radius outside direction of the support plate **10**. Thus, the wafer W loaded on the support plate **10** may readily be unloaded therefrom.

As described above, the first to third sub-magnets **226**, **326**, and **426** are disposed at the fourth height h_4, which are lower than the first to third magnets **224**, **324**, and **424**. However, the first to third sub-magnets **226**, **326**, and **426** may be disposed at a higher position than the first to third magnets **224**, **324**, and **424**. Further, the heights of the first to third magnets **224**, **324**, and **424** are exchangeable with each other.

FIG. **10** illustrates the driving state of a safety unit **700** according to the present invention. The safety unit **700** includes a rotating bar **720**, a safety weight **740**, a hinge **760**, and a movable hinge **780**. The safety unit **700** prevents the first chucking pin **20**, which comes in contact with the edge portion of a wafer W due to the rotation of a support plate **10**, from separating from the edge portion of the wafer W.

During a process, the support plate **10** is rotated by the rotation of a rotation shaft **12**. Due to the rotation of the support plate **10**, a centrifugal force is applied to a first chucking pin **20** provided to support a wafer W loaded on the support plate **10** and a first follower rod **240** connected to the first chucking pin **20**. The force applied onto the first follower rod **240** is shown in FIG. **10**.

An elastic force F_e generated by a first elastic member **282** and a centrifugal force F_c generated by the ration of the support plate **10** are applied to the first follower rod **240**. The directions of the elastic force F_e and the centrifugal force F_c are opposite to each other. If the elastic force F_e is stronger than the centrifugal force F_c, the centrifugal force F_c is offset by the elastic force F_e to prevent the first chucking pin **20** from separating from the wafer W. On the other hand, if the centrifugal force F_c is stronger than the elastic force F_e, the centrifugal force F_c is not offset by the elastic force F_e to separate the first chucking pin **20** from the wafer W. Since the centrifugal force F_c is proportional to revolution per minute (RPM), it becomes stronger when the support plate **10** rotates at a high speed. Due to the stronger centrifugal force F_c, the first chucking pin **20** may be separated from the wafer W.

A first protrusion **242** is provided to the first follower rod **240** disposed in a first guide hole **262**. The first protrusion **242** protrudes perpendicularly from the first follower rod **240**. One end of the rotation bar **720** is rotatably connected to the first protrusion **242** by means of the rotatable hinge **780**.

The safety weight **740** is provided to the other end of the rotation bar **720**. The safety weight **740** has a mass enough to prevent the first chucking pin **20** from separating from the wafer W even if a centrifugal force is applied.

A central portion of the rotation bar **720** is rotatably connected to a bottom portion of the first guide hole **262** of a first bush **260** by means of the hinge **760**. The hinge **760** is movable up and down along a first guide groove **264** formed at the first bush **260**, and the first follower rod **240** is freely movable in the radius direction of the support plate **10**.

The operation of the safety unit **700** will now be described below with reference to FIG. **10**.

As illustrated in FIG. **10**, when the support plate **10** is rotated, a centrifugal force F_1 is applied to the safety weight **740**. The centrifugal force F_1 acts in the radius outside direction of the support plate **10**, causing a torque T around the hinge **760** to rotate the rotation bar **720** counterclockwise.

Due to the torque T, a resisting force F_2 is generated at one end of the rotation bar **720** connected to the first protrusion **242**. The direction of the resisting force F_2 is opposite to that of the centrifugal force F_1. The resisting force F_2 acts in the radius inside direction of the support plate **10**. The direction of the resisting force F_2 is opposite to not only that of the centrifugal force F_1 but also that of the centrifugal force F_c.

Thus, not only the centrifugal force F_c and the elastic force F_e but also the resisting force F_2 is applied to the first follower rod **240**. Even if the centrifugal force F_c is stronger than the elastic force F_e, it may be offset by the elastic force F_e and the resisting force F_2. It is therefore possible to prevent the first chucking pin **20** from separating from the wafer W.

According to the present invention, chemicals remaining on the contact surface of a wafer can be removed and the entire surface of the wafer can be treated uniformly during a process. Moreover, it is possible to suppress process defects generated at the contact surface of a wafer and prevent a chucking pin from separating from the substrate even when a support plate is rotated.

Although the present invention has been described in connection with the embodiment of the present invention illustrated in the accompanying drawings, it is not limited thereto. It will be apparent to those skilled in the art that various substitutions, modifications and changes may be made without departing from the scope and spirit of the invention.

What is claimed is:

1. A spin head, comprising:

a rotatable support plate;

first chucking pins and second chucking pins installed on a top surface of the rotatable support plate to support an edge portion of a substrate and prevent the substrate loaded on the rotatable support plate from separating from the rotatable support plate when the rotatable support plate rotates; and

a driving unit for selectively moving the first and second chucking pins in an outside radial direction of the rotatable support plate via a magnetic force such that the first and second chucking pins are not in contact with the edge portion of the substrate during a process, the driving unit includes:

first follower parts each including a first magnet which is connected to the first chucking pins and travels with the first chucking pin in a radial inside direction of the support plate by the magnetic force;

second follower parts each including a second magnet which is connected to the second chucking pins and traveling with the second chucking pin in a radial inside direction of the support plate by the magnetic force;

a driving magnet disposed inside the first and second follower parts; and an elevating member for selectively applying a magnetic force to the first magnet disposed at a first height and the second magnet disposed at a second height to elevate the driving magnet.

2. The spin head of claim 1, wherein one side of the respective first and second magnets opposite to the driving magnet has a same polarity as one side of the driving magnet.

3. The spin head of claim 1, further comprising:

third chucking pins installed on the top surface of the rotatable support plate and supporting the edge portion of the substrate,

wherein the driving unit further includes third follower parts each including a third magnet which is connected to the third chucking pin and travels with the third chucking pin in a radial inside direction of the rotatable support plate by the magnetic force, and the third magnetic is located at a third height which is different from the first height and the second height.

4. The spin head of claim 1, wherein the first follower part further includes a first sub-magnet disposed at a third height which is different from the first height and the second height, and the second follower part further includes a second sub-magnet disposed at the third height; and

wherein the driving magnet applies a magnetic force to the first and second sub-magnets to move the first and second chucking pins in the radial outside direction of the support plate at the same time.

5. The spin head of claim 1, wherein the driving unit further comprises:

a first elastic substance connected to the first chucking pin and providing an elastic force to the first chucking pin in the radial inside direction of the rotatable support plate; and

a second elastic substance connected to the second chucking pin and providing an elastic force to the second chucking pin the radial inside direction of the rotatable support plate,

wherein the driving magnet allows the first and second chucking pins to travel in the radial outside direction of the support plate.

6. The spin head of claim 1, wherein the first follower part comprises:

a first housing in which the first magnet is accommodated;

a first follower rod extending from the first chucking pin in the radial inside direction of the rotatable support plate and connecting the first chucking pin with the first housing;

a first bush fixed to a bottom surface of the rotatable support plate and guiding a travel direction of the first follower rod;

a first elastic substance connected to the first bush and providing an elastic force to the first follower rod in the radial inside direction of the rotatable support plate; and

a first fixture connected to the other end of the first elastic substance and fixed onto the first follower rod.

7. The spin head of claim 1, further comprising:

a safety unit provided to prevent the first or second chucking pin contacting the edge portion of the substrate from traveling in the radial outside direction of the rotatable support plate when the rotatable support plate is rotated.

8. The spin head of claim 7, wherein the safety unit comprises:

a first rotation bar having one end connected onto the first follower rod connected to the first chucking pin, the first rotation bar being rotatable;

a first safety weight connected to the other end of the first rotation bar;

a first hinge for fixing a center of the first rotation bar to prevent the center of the first rotation bar from moving in a radial inside direction of the rotatable support plate;

a second rotation bar having one end connected onto the second follower rod connected to the second chucking pin, the second rotation bar being rotatable;

a second safety weight connected to the other end of the second rotation bar; and

a second hinge for fixing a center of the second rotation bar to prevent the center of the second rotation bar from moving in the radial inside direction of the rotatable support plate,

wherein the first and second rotation bars rotate over the first and second hinges due to a centrifugal force generated by the rotation of the rotatable support plate; and

wherein one end of the respective first and second rotation bars moves in the radial inside direction of the rotatable support plate, and the other end of the respective first and second rotation bars moves in the radial outside direction of the rotatable support plate.

9. A spin head, comprising:

a rotatable support plate;

first chucking pins, second chucking pins, and third chucking pins installed on a top surface of the rotatable support plate and supporting an edge portion of a substrate to prevent the substrate loaded on the rotatable support plate from separating from the rotatable support plate when the rotatable support plate is rotated; and

a driving unit for moving the first to third chucking pins in a radial direction of the rotatable support plate such that the first to third chucking pins are in contact with or not in contact with the edge portion of the substrate,

wherein the driving unit allows one of the first to third chucking pins not to be in contact with the edge portion of the substrate by a magnetic force, the driving unit includes:

first follower parts each including a first magnet which is connected to the first chucking pin and travels with the first chucking pin in the radial direction of the rotatable support plate by the magnetic force;

second follower parts each including a second magnet which is connected to the second chucking pin and travels with the second chucking pin in the radial direction of the rotatable support plate by the magnetic force;

third follower parts each including a third magnet which is connected to the third chucking pin and travels with the third chucking pin in the radial direction of the rotatable support plate by the magnetic force;

a driving magnet disposed inside the first to third follower parts; and

an elevating member for elevating the driving magnet to selectively apply a magnetic force to the first magnet disposed at a first height, the second magnet disposed at a second height, and the third magnet disposed at a third height.

10. The spin head of claim 9, wherein one side of the respective first to third magnets opposite to the driving magnet has a same polarity as one side of the driving magnet opposite to the first to the third magnets.

11. A substrate treating method performed by providing a spin head including first and second chucking pins for supporting an edge portion of a substrate loaded on a support plate and a driving unit for moving the first and second chucking pins in a radial direction of the support plate and supplying a treating solution to the substrate loaded on the spin head, the substrate treating method comprising:

elevating a driving magnet of the driving unit to apply a magnetic force to a first magnet connected to the first chucking pins respectively, and the first chucking pins are spaced apart from the edge portion of the substrate by the magnetic force; and

elevating the driving magnet to apply a magnetic force to a second magnet connected to the respective second chucking pins, respectively, and the second chucking pins are spaced apart from the edge portion of the substrate by the magnetic force,

wherein the first magnet is disposed at a first height and the second magnet is disposed at a second height that is different from the first height, and applying the magnetic force to the first and second magnets are alternately repeated by the elevation of the driving magnet.

12. The substrate treating method of claim **11**, further comprising:

loading/unloading the substrate on/from the support plate while applying a magnetic force to first sub-magnets connected to the first chucking pins respectively and second sub-magnets connected to the second chucking pins respectively to move the first and second chucking pins in the radial direction of the support plate at the same time.

13. The substrate treating method of claim **12**, wherein one side of the respective first and second sub-magnets opposite to the driving magnet has a same polarity as one side of the driving magnet opposite to the first and second sub-magnet.

14. The substrate treating method of claim **11**, wherein the spin head further includes third chucking pins configured to support the edge portion of the substrate,

the substrate treating method further comprising:

elevating the driving magnet to apply a magnetic force to third magnets connected to the third chucking pins respectively, and the third chucking pins are spaced apart from the edge portion of the substrate by the magnetic force,

wherein the third magnet is disposed at a third height that is different from the first height and the second height, and applying the magnetic force to the first to the third magnets are sequentially repeated by the elevation of the driving magnet.

15. A substrate treating method, comprising:

supporting an edge portion of a substrate loaded on a support plate via first chucking pins, second chucking pins, and third chucking pins during a process,

elevating a driving magnet of a driving unit to apply a magnetic force to a first magnet connected to the first chucking pins, respectively; and

elevating the driving magnet to apply a magnetic force to a second magnet connected to the respective second chucking pins, respectively,

wherein the first magnet is disposed at a first height and the second magnet is disposed at a second height that is different from the first height, and

wherein one of the first to third chucking pins is not in contact with the edge portion of the substrate and the others are in contact therewith, and one of the first to third chucking pins not being in contact with the edge portion of the substrate is alternately selected.

* * * * *